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RESULTS OF INVESTIGATION,

SECONDARY CONTAINMENT STRUCTURE A-1-ZF, PLANT A-1

LOCKHEED-CALIFORNIA COMPANY
BURBANK, CALIFORNIA

SUBMITTED
TO
CALIFORNIA REGIONAL WATER QUALITY
CONTROL BOARD - LOS ANGELES REGION

FROM
LOCKHEED-CALIFORNIA COMPANY
BURBANK, CALIFORNIA 91520

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FEBRUARY 1, 1985

RESULTS OF INVESTIGATION,
SECONDARY CONTAINMENT STRUCTURE A-1-ZF, PLANT A-1

Introduction

During the underground tank leak investigation conducted at Lockheed Plant A-1, Mr. Joshua Workman, of the California Regional Water Quality Control Board (RWQCB) requested in a letter dated October 3, 1984 to Mr. R.L. Miland of Lockheed-California Company, that an additional investigation be conducted for inactive metal cleaning and plating facilities, in Buildings 68 and 69, Plant A-1. Messrs. Novak of the RWQCB, Carberry of Lockheed-California Company, and Gregg of Gregg and Associates, Inc. met at the aforementioned location on October 12, 1984 and agreed on a program. This report describes the results of an investigation at the above-ground secondary containment structure, A-1-ZF. During the site meeting, it was planned that 11-ten foot borings and lysimeters should be drilled and installed, respectively (four borings each along the east and west sides and three borings along the north side). The suction lysimeters are referred to as A-1-ZF-SL1-9, A-1-A-SL1 (which also monitors nearby Sump A-1-A) and A-1-M-SL1 (which also monitors nearby Clarifier A-1-M). Mr. Novak observed the drilling of three of the borings on the night of October 22, 1984.

A-1-ZF is an above-ground secondary containment structure beneath 16 large dip tanks. Although the dip tanks were emptied in the Fall of 1984, they have contained caustic soda, distilled

water, surfactants, sodium hydroxide, sodium bicarbonate, several different chromium solutions (including sodium dichromate and chromic acid), sulfuric acid and for a very brief period, nitric acid. As a consequence, the soils were analyzed for pH, chromium, and sulfate.

This report is organized basically into two parts - a text and a supporting appendix. The text provides a description of A-1-ZF and a discussion of the drilling and laboratory programs. In addition, the results of the chemical analyses are presented and conclusions about the integrity of the containment and recommendations for future investigations are made. Site maps showing the locations of A-1-ZF and the associated boreholes/lysimeters, and a table providing program information and construction data on the containment structure are presented in the appendix. The appendix also provides supporting discussions, borehole diagrams, and chemistry tables pertaining to site-specific drilling information and chemical analyses. A general overview of the Underground Tank Leak Detection Program at Lockheed-California Company and information on the investigative processes involved may be found in "Results of Undergound Tank Leak Detection Program for Plant A-1" dated January, 1985.

Conclusions

Laboratory analyses indicate that some of the soil adjacent to the overspill is contaminated with chromium and sulfate. The presence of chromium and sulfate in the soils around A-1-ZF

suggests that sodium dichromate, chromic acid, and/or sulfuric acid from the dip tanks may have entered the soil through cracks in the underlying containment structures. The highest concentration of chromium was found [illegible] boring for Suction Lysimeter A-1-A-SL1, at Sump A-1-A. pH levels were near the levels observed in the background samples (with the exception of the 5.5 foot soil sample from the boring for Suction Lysimeter A-1-M-SL1, located alongside a dip tank that had contained dilute sodium hydroxide, where a pH of 9.8 was reported). Based on laboratory analyses of soil samples collected from Secondary Containment Structure A-1-ZF, it is concluded that the containment had leaked.

Recommendations

It is recommended that several borings be drilled to depths of 30 feet for the purpose of defining the vertical extent of the soil contamination and that the suction lysimeters be sampled quarterly, for a period of two quarters, to determine if there were other sources for the contamination besides Secondary Containment Structure A-1-ZF.

APPENDIX

SECONDARY CONTAINMENT STRUCTURE A-1-ZF

FIELD PROGRAM

Nine suction lysimeters were installed to monitor subsurface conditions at Overspill Collar A-1-ZF. This facility was not included in the initial Work Plan because it is an above-ground installation. Subsequent discussions with Mr. Al Novak of the RWQCB, however, concluded that, because of the facility's proximity and relationship to underground containment structures, it too should be included in this monitoring program. The collar provides secondary containment for a series of large, above-ground process and pickling tanks. The tanks contained various liquids including chromic acid, sulfuric acid, alkaline cleaners, sodium hydroxide, and spray rinse water. The locations of the suction lysimeters are shown on the site map. The east side of the collar is monitored by Suction Lysimeters A-1-ZF-SL1, A-1-ZF-SL2 and A-1-ZF-SL3. The north end of the collar is monitored by Suction Lysimeters A-1-ZF-SL4, A-1-ZF-SL5 and A-1-ZF-SL6. The west side of the collar is monitored by Suction Lysimeters A-1-ZF-SL7, A-1-ZF-SL8, and A-1-ZF-SL9. The east side is also monitored by Suction Lysimeter A-1-M-SL1, which was installed primarily to monitor Clarifier A-1-M, and the west side is also monitored by Suction Lysimeter A-1-A-SL1, which was installed primarily to monitor Sump A-1-A. Discussion of the results of the drilling and testing of soil samples for Suction Lysimeters A-1-M-SL1 and A-1-A-SL1 is contained in a report entitled "Results of Underground Tank Leak Detection Program for Plant A-1" dated January, 1985.

SUCTION LYSIMETER A-1-ZF-SL1

Monitoring Installations - Suction Lysimeter A-1-ZF-SL1 was installed as directed by Mr. Novak of the RWQCB. The location of the suction lysimeter is indicated on the site map.

Sampling Intervals - Soil samples were taken at depths of 5 and 10 feet, as approved by Mr. Novak.

Field Observations - The medium-to-fine grain size and brown color of the sand remained consistent throughout the first 6 feet of the borehole. At 6 feet, the sand became coarser and the gravel and cobble fraction increased, which corresponds to a color change at the same depth. At 6 feet, the color changed drastically from brown to variegated light brown, which

depth.

Indications of possible contamination were based upon observations of odor, color, moisture content, and soil consistency.

There were no indications of contamination.

SECONDARY CONTAINMENT STRUCTURE A-1-ZF (continued)

SUCTION LYSIMETER A-1-ZF-SL2

Monitoring Installations - Suction Lysimeter A-1-ZF-SL2 was installed as directed by Mr. Novak of the RWQCB. The location of the suction lysimeter is indicated on the site map.

Sampling Intervals - Soil samples were taken at depths of 5 and 10 feet, as approved in the field by Mr. Novak.

Field Observations - The medium-to-fine grain size and brown color of the sand remained consistent throughout the first 7 feet of the borehole. At 7 feet, the sand became coarser and the gravel and cobble fraction increased, which corresponds to the color change to variegated light brown at the same depth.

There were no indications of contamination.

SUCTION LYSIMETER A-1-ZF-SL3

Monitoring Installations - Suction Lysimeter A-1-ZF-SL3 was installed as directed by Mr. Novak. Two attempts were made to install the lysimeter to the planned depth, an electrical conduit 2 feet below the surface, however, prevented successful completion of the first attempt. The second attempt reached completion depth of 10 feet. The location of the suction lysimeter is indicated on the site map.

Sampling Intervals - Soil samples were taken at depths of 5 and 10 feet, as approved in the field by Mr. Novak.

Field Observations - The medium-to-coarse grain size and brown color of the sand, and the common occurrence of gravel remained consistent throughout the entire borehole.

There were no indications of contamination.

SUCTION LYSIMETER A-1-ZF-SL4

Monitoring Installations - Suction Lysimeter A-1-ZF-SL4 was installed as directed by Mr. Novak. The location of the suction lysimeter is indicated on the site map.

Sampling Intervals - Soil samples were taken at depths of 5 and 10 feet, as approved in the field by Mr. Novak.

Field Observations - The medium to fine grain size and brown color of the sand remained consistent throughout the first 5 feet of the borehole. At 5 feet, the sand became coarser and the gravel and cobble fraction increased, which corresponds to the color change at the same depth. At 8 feet, the sand became very

SECONDARY CONTAINMENT STRUCTURE A-1-ZF (continued)

fine and the gravel and cobble fraction disappeared completely. From 5 to 8 feet, the color changed from brown to variegated light brown which corresponds with the general grain size increase at the same depth. At 8 feet, the soil returned to a brown color.

There were no indications of contamination.

SUCTION LYSIMETER A-1-ZF-SL5

Monitoring Installations - Suction Lysimeter A-1-ZF-SL5 was installed as directed by Mr. Novak. The location of the suction lysimeter is indicated on the site map.

Sampling Intervals - Soil samples were taken at depths of 5 and 10 feet, as approved in the field by Mr. Novak.

Field Observations - The medium-to-fine grain size of the sand remained consistent throughout the first 8 feet of the borehole. At 8 feet, the sand became finer, and the gravel and cobble fraction decreased. The soil was brown in color throughout the borehole.

There were no indications of contamination.

SUCTION LYSIMETER A-1-ZF-SL6

Monitoring Installations - Suction Lysimeter A-1-ZF-SL6 was installed as directed by Mr. Novak. The location of the suction lysimeter is indicated on the site map.

Sampling Intervals - Soil samples were taken at depths of 6 and 10 feet, as approved in the field by Mr. Novak.

Field Observations - The medium-to-fine grain size of the sand became increasingly coarse with depth. At 7 feet, the sand became much coarser, and the gravel fraction increased, which corresponds to the color change at the same depth. The soil was brown in color throughout the first 7 feet. At 7 feet, the color changed slightly from brown to red, which may indicate chromic acid contamination.

There were possible indications of contamination.

SUCTION LYSIMETER A-1-ZF-SL7

Monitoring Installations - Suction Lysimeter A-1-ZF-SL7 was installed as directed by Mr. Novak. The location of the suction lysimeter is indicated on the site map.

SECONDARY CONTAINMENT

A-1-ZF (continued)

Sampling Intervals
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Field Observatio
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samples, individual depth
sulfate, and pH in the

analysis results
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levels of sulfate
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SUCTION

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Sampling
10 feet, as

Field Observations
remained consistent
gravel and cobbles rema
The soil was brown in colo
feet, the color shade changed

There were no indications of contami

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kg.
nd

SUCTION LYSIMETER A-1-ZF-SL9

Monitoring Installations - Suction Lysimeter A-1
installed as directed by Mr. Novak. The location of
lysimeter is indicated on the site map.

Sampling Intervals - Soil samples were taken at depths of 5 and 10 feet, as approved in the field by Mr. Novak. The lower 3 feet of the borehole was blocked by caving sand after the 10-foot sample was extracted, therefore the lysimeter was placed at a depth of 7 feet.

Field Observations - The medium-to-coarse grain size of the sand remained consistent throughout the borehole. The occurrence of gravel and cobbles remained frequent throughout the boring. The soil was a variegated light brown color throughout the excavation.

There were no indications of contamination.

SECONDARY CONTAINMENT STRUCTURE A-1-ZF (continued)

LABORATORY PROGRAM AND ANALYSIS

Laboratory Program - Based on field observations of the potential presence of contaminants in the soil samples, individual depth samples were analyzed for chromium, sulfate, and pH in the laboratory.

Laboratory Analysis - The pertinent laboratory analysis results are summarized in Table A-1-ZF. Concentrations of chromium and sulfate were above background concentrations (4.4 and 2.9 mg/kg, respectively) in 12 out of 22 soil samples analyzed. Eight additional samples had moderate to high levels of sulfate contamination; chromium levels for these samples were below the levels reported for the background samples.

The sulfate contamination found in the soils around A-1-ZF may be the result of leakage of the containment pits beneath the dip tank containing sulfuric acid or beneath that containing chromic acid (chromic acid is the product of a sulfuric acid/sodium dichromate mixture).

The presence of chromium in the soils around A-1-ZF suggests that sodium dichromate and chromic acid from the dip tanks may have entered the soil through cracks in the underlying containment structure.

The concentration of chromium in the contaminated samples ranged from 7.6 to 102 mg/kg and sulfate ranged from 8.7 to 260 mg/kg. pH levels were near the levels observed in the background samples, with the exception of the 5.5-foot soil sample collected from the boring for Suction Lysimeter A-1-M-SL1, which had a pH of 9.8. That boring is located alongside a dip tank which had contained dilute sodium hydroxide. In general, soil samples collected from the borings for Suction Lysimeters A-1-ZF-SL2-5, all located near the north-east corner of the containment, had the lowest levels of contamination. The high levels of chromium and sulfate found in samples collected near Sump A-1-A (adjacent to the west side of Secondary Containment Structure A-1-ZF) are probably the result of overflow or leakage of the sump. Samples collected from A-1-ZF-SL7 and A-1-ZF-SL9, also on the west side of Secondary Containment Structure A-1-ZF, had far lower levels of contamination. In general, concentrations of chromium and sulfate were higher in samples collected from borings adjacent to the southern part of the secondary containment structure.

CONCLUSIONS

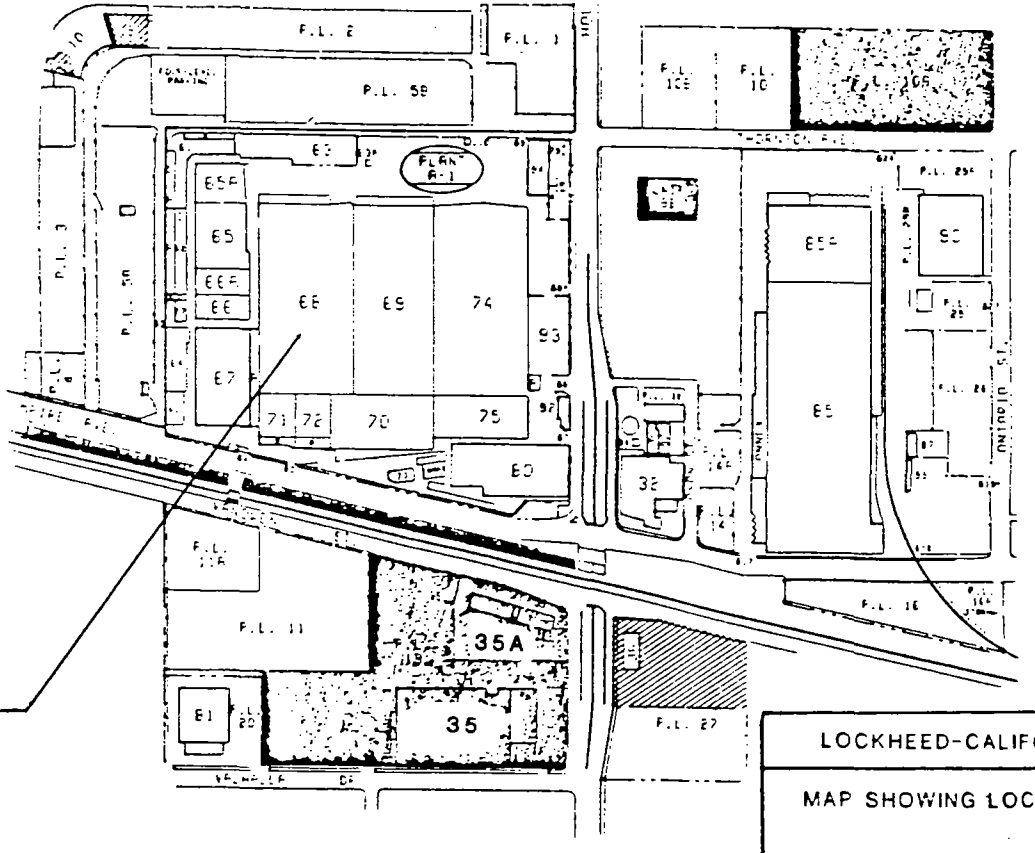
Laboratory analyses indicate that some of the soil around the overspill is contaminated with chromium and sulfate. Other than the reddish color of the soil noted in the drilling report for

SECONDARY CONTAINMENT STRUCTURE A-1-ZF

Suction Lysimeter A-1-ZF-SL6 (suggesting chromic acid contamination), field observations do not suggest soil contamination around the A-1-ZF facility. The laboratory analyses, however, do suggest that the secondary containment structure had leaked. Furthermore, the distribution of the higher concentrations of chromium and sulfate, with regards to the borehole location from which the samples were taken, indicates that the southern part of the secondary containment structure, Clarifier A-1-M, and Sump A-1-A are probably the main sources for the contamination.

RECOMMENDATIONS

Additional drilling, sampling, and chemical analyses should be conducted to further determine the exact origin and extent of the contamination. Several additional borings should be drilled to depths of 30 feet to assess the vertical extent of the contamination. The suction lysimeters should be sampled quarterly, for a period of two quarters, to determine the origin of the contamination.



LOCKHEED-CALIFORNIA COMPANY

MAP SHOWING LOCATION OF

UNDERGROUND TANKS, CLARIFIERS,

OR SUMPS AT PLANT A-1

Tank No.		A-1-ZF
Plant No./Nearest Bldg.		A1/Bldg. 68 (inside)
Tank:	Location	2555 N. Hollywood Way
	Installation Date	UNK
	Capacity, gal.	UNK
	Use/Process	Secondary containment Overspill containment
	Contents (past,CAS No.,date)	Chromic acid Sulfuric acid Alkaline cleaner Sodium hydroxide
	(present,CAS No.)	Empty (Fall, 1984)
	Construction Materials	Concrete
	Geometry	Rectangular
	Depth to Top	UNK
	Depth to Invert	UNK
	Diameter	100 ft
	Length (1)	70 ft
	Containment	Secondary containment
	Corrosive Protection (2)	UNK
	Status	Abandoned
Tank Piping:	Number	UNK
	Type	UNK
	Construction Mat.	Steel
Site:	Paving Material/Thickness	Concrete/6-10 in.
	Appearance	Poor
	Surface Contamination	Yes
Drilling Program:	Rig Type/Requirements (3)	H.S.Auger
	Borings (No.)	0
	Sample Depths	
	Vapor Wells/Lysimeters (No.)	11
	Sample Depths	A-1-ZF-SL1-5,6,9: 5,10 ft A-1-ZF-SL6,7: 6,10 ft A-1-A-SL1: 5,10 ft A-1-M-SL1: 5.5,10 ft
	Completion Interval	A-1-ZF-SL1-9: 10 ft A-1-A-SL1: 10 ft A-1-M-SL1: 10 ft
Laboratory Program (4)	No. of Tank Content Samples	0
	Parameters	N.A.
	No. of Tank Soil Samples	22
	Parameters	Cr,SO4,pH

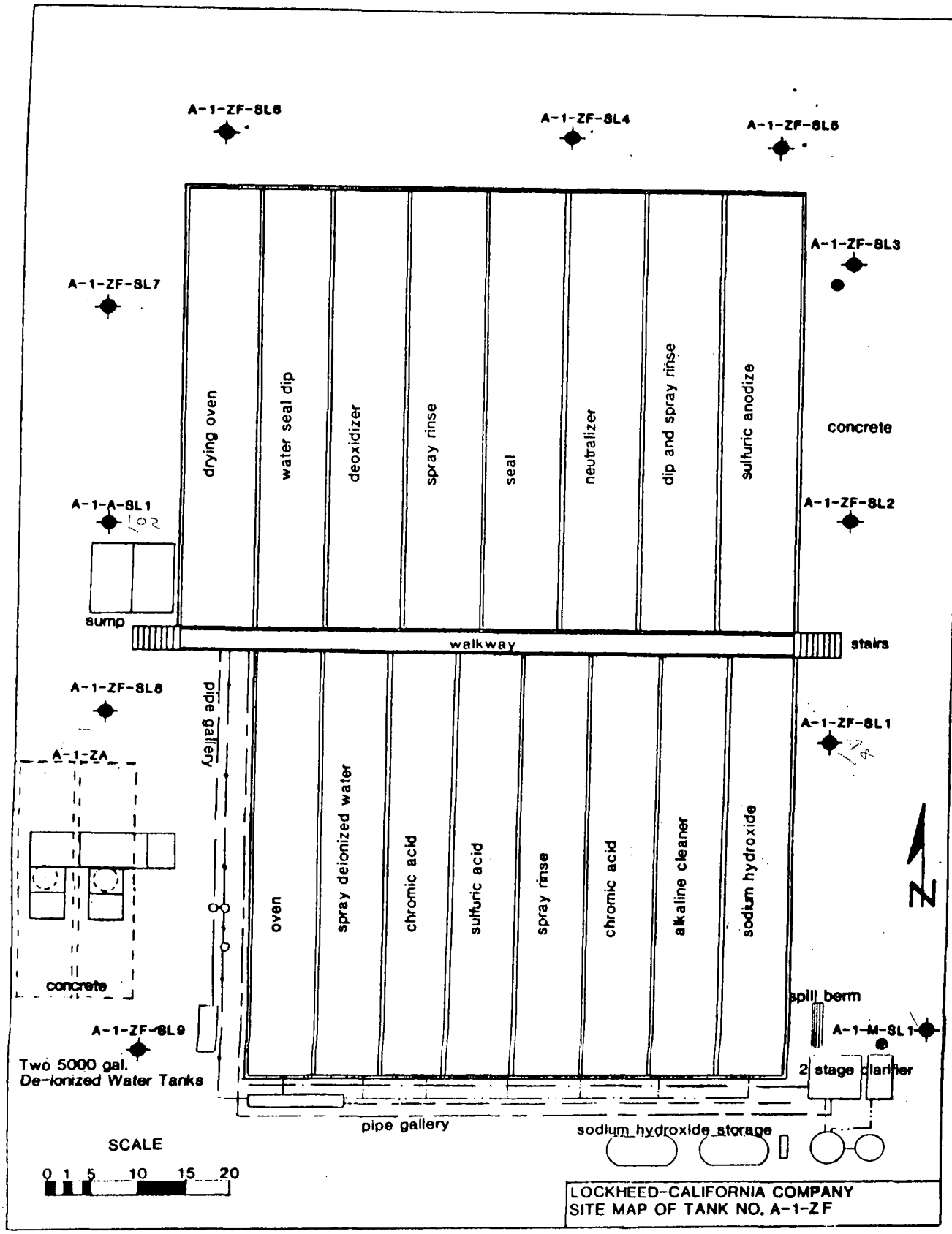

A-1-ZF-SL6
A-1-ZF-SL4
A-1-ZF-SL5
A-1-ZF-SL3
A-1-ZF-SL7
drying oven
water seal dip
deoxidizer
spray rinse
seal
neutralizer
dip and spray rinse
sulfuric anodize
concrete
A-1-A-SL1
A-1-ZF-SL2
sump
walkway
stairs
A-1-ZF-SL8
pipe gallery
A-1-ZF-SL1
A-1-ZA
oven
spray deionized water
chromic acid
sulfuric acid
spray rinse
chromic acid
alkaline cleaner
sodium hydroxide
N
concrete
spill berm
A-1-ZF-SL9
A-1-M-SL1
Two 5000 gal.
De-ionized Water Tanks
2 stage clarifier
pipe gallery
sodium hydroxide storage
SCALE
0 1 5 10 15 20
LOCKHEED-CALIFORNIA COMPANY
SITE MAP OF TANK NO. A-1-ZF

TABLE A-1-ZF: CHEMICAL ANALYSES

PARAMETER	BACK-GROUND SAMPLE	TTLC	SAMPLE NO. A-1-ZF SL1 5 ft.	A-1-ZF SL1 10 ft.	A-1-ZF SL2 5 ft.	A-1-ZF SL2 10 ft.	A-1-ZF SL3 5 ft.	A-1-ZF SL3 10 ft.	A-1-ZF SL4 5 ft.	A-1-ZF SL4 10 ft.
Volatile Organics (ug/kg)		N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Benzene	<0.2									
Bromodichloromethane	<0.1									
Bromoform	<0.7									
Chloroethane	<0.8									
Chloroform	<0.1									
Chloromethane	<0.2									
Perchloroethylene	<0.4									
Toluene	<0.4									
1,1,1 Trichlorethane	<0.2									
1,1,2 Trichloroethane	<0.1									
Trichloroethene	<0.3	* 2,040								
Vinyl Chloride	<0.2									
Stoddard Solvent (mg/kg)	N.T.	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Petroleum Hydrocarbon (mg/kg)	<2.0	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Oil & Grease (mg/kg)	N.T.	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
CAM Metals (mg/kg)										
Antimony	<2.5	500								
Arsenic	7.21	500								
Barium	46.7	10,000								
Beryllium	<1.0	75								
Cadmium	<2.5	100								
Chromium (Total)	4.4	2,500	40.0	48.1	6.8	6.2	4.7	4.8	19.8	2.6
Cobalt	3.0	8,000								
Copper	16.7	250								
Lead	<2.5	1,000								
Mercury	<0.1	20								
Molybdenum	3.8	3,500								
Nickel	4.1	2,000								
Selenium	<2.5	100								
Silver	<2.5	500								
Thallium	<2.5	700								
Vanadium	10.7	2,400								
Zinc	26.6	2,500								
Others										
pH (standard units)	8.64	N.A.	8.69	7.92	8.43	8.53	8.25	8.44	8.62	8.78
Sodium	N.T.	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Chloride (mg/kg)	N.T.	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Flouride (mg/kg)	N.T.	18,000	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Cyanide (mg/kg)	<0.2	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Sulfate (mg/kg)	2.9	N.A.	41	30	18	17	8.7	11	14	<8.0

N.A. NOT AVAILABLE
N.D. NOT DETECTED
N.T. NOT TESTED
TTLC TOTAL THRESHOLD LIMIT CONCENTRATION

TABLE A-1-ZF (CONTINUED): CHEMICAL ANALYSES

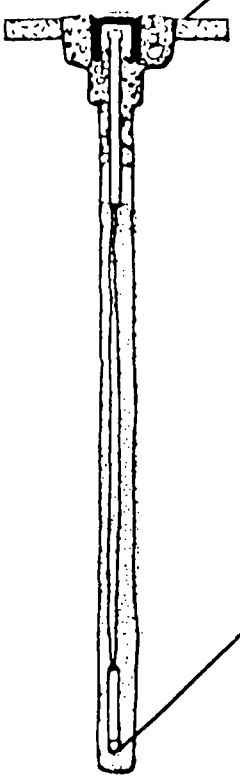
PARAMETER	BACK-GROUND SAMPLE	TTLC	SAMPLE NO. A-1-ZF SL5 5 ft.	A-1-ZF SL5 10 ft.	A-1-ZF SL6 6 ft.	A-1-ZF SL6 10 ft.	A-1-ZF SL7 6 ft.	A-1-ZF SL7 10 ft.	A-1-ZF SL8 5 ft.	A-1-ZF SL8 10 ft.
Volatile Organics (ug/kg)		N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Benzene	<0.2									
Bromodichloromethane	<0.1									
Bromoform	<0.7									
Chloroethane	<0.8									
Chloroform	<0.1									
Chloromethane	<0.2									
Perchloroethylene	<0.4									
Toluene	<0.4									
1,1,1 Trichlorethane	<0.2									
1,1,2 Trichloroethane	<0.1									
Trichloroethene	<0.3	* 2,040								
Vinyl Chloride	<0.2									
Stoddard Solvent (mg/kg)	N.T.	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Petroleum Hydrocarbon (mg/kg)	<2.0	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Oil & Grease (mg/kg)	N.T.	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
CAM Metals (mg/kg)										
Antimony	<2.5	500								
Arsenic	7.21	500								
Barium	46.7	10,000								
Beryllium	<1.0	75								
Cadmium	<2.5	100								
Chromium (Total)	4.4	2,500	3.1	2.7	4.5	11.3	7.6	12.1	5.2	23.7
Cobalt	3.0	8,000								
Copper	16.7	250								
Lead	<2.5	1,000								
Mercury	<0.1	20								
Molybdenum	3.8	3,500								
Nickel	4.1	2,000								
Selenium	<2.5	100								
Silver	<2.5	500								
Thallium	<2.5	700								
Vanadium	10.7	2,400								
Zinc	26.6	2,500								
Others										
pH (standard units)	8.64	N.A.	7.25	8.27	9.37	8.53	8.78	8.25	8.08	7.56
Sodium	N.T.	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Chloride (mg/kg)	N.T.	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Flouride (mg/kg)	N.T.	18,000	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Cyanide (mg/kg)	<0.2	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Sulfate (mg/kg)	2.9	N.A.	9.3	<8.0	17	13	10	13	26	80

N.A. NOT AVAILABLE
N.D. NOT DETECTED
N.T. NOT TESTED
TTLC TOTAL THRESHOLD LIMIT CONCENTRATION

TABLE A-1-ZF (CONTINUED): CHEMICAL ANALYSES

PARAMETER	BACK-GROUND SAMPLE	TTLC	SAMPLE NO. A-1-ZF SL9 5 ft.	A-1-ZF SL9 10 ft.	A-1-A SL1 5 ft.	A-1-A SL1 10 ft.	A-1-M SL1 5.5 ft.	A-1-M SL1 10 ft.
Volatile Organics (ug/kg)		N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Benzene	<0.2							
Bromodichloromethane	<0.1							
Bromoform	<0.7							
Chloroethane	<0.8							
Chloroform	<0.1							
Chloromethane	<0.2							
Perchloroethylene	<0.4							
Toluene	<0.4							
1,1,1 Trichlorethane	<0.2							
1,1,2 Trichloroethane	<0.1							
Trichloroethene	<0.3	* 2,040						
Vinyl Chloride	<0.2							
Stoddard Solvent (mg/kg)	N.T.	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Petroleum Hydrocarbon (mg/kg)	<2.0	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Oil & Grease (mg/kg)	N.T.	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
CAM Metals (mg/kg)								
Antimony	<2.5	500						
Arsenic	7.21	500						
Barium	46.7	10,000						
Beryllium	<1.0	75						
Cadmium	<2.5	100						
Chromium (Total)	4.4	2,500	16.1	25.9	102	65.8	6.4	30.1
Cobalt	3.0	8,000						
Copper	16.7	250						
Lead	<2.5	1,000						
Mercury	<0.1	20						
Molybdenum	3.8	3,500						
Nickel	4.1	2,000						
Selenium	<2.5	100						
Silver	<2.5	500						
Thallium	<2.5	700						
Vanadium	10.7	2,400						
Zinc	26.6	2,500						
Others								
pH (standard units)	8.64	N.A.	8.80	8.59	7.88	7.91	9.80	7.95
Sodium	N.T.	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Chloride (mg/kg)	N.T.	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Flouride (mg/kg)	N.T.	18,000	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Cyanide (mg/kg)	<0.2	N.A.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.
Sulfate (mg/kg)	2.9	N.A.	33	27	250	260	81	210

N.A. NOT AVAILABLE
N.D. NOT DETECTED
N.T. NOT TESTED
TTLC TOTAL THRESHOLD LIMIT CONCENTRATION

CONSTRUCTION DETAILS	DEPTH	LOG	BLOW CNTS	LITHOLOGIC DESCRIPTION
	- 0 -			Concrete
	- 1 -			Sand, fine to medium grain, brown, some pea size gravel & occasional small cobbles
	- 2 -			
	- 3 -			
	- 4 -			
	- 5 -		35	
	- 6 -			Color change, sand, lighter & coarser
	- 7 -			Sand, medium grain, brown frequent cobbles to 8-inches
	- 8 -			
	- 9 -			
	- 10 -		18	
	- 11 -			
	- 12 -			
	- 13 -			
	- 14 -			
	- 15 -			
	- 16 -			
	- 17 -			
	- 18 -			
	- 19 -			
	- 20 -			

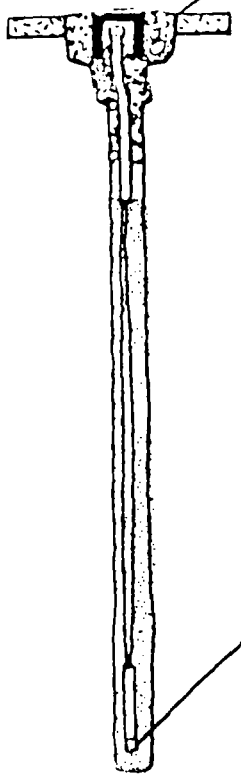
COMPLETION & BACKFILL

-Suction Lysimeter at 10 ft
-Concrete, 0-4 ft
-Bentonite, 4-5 ft
-Clean sand, 5-6 ft
-Silica sand, 6-10 ft

TANK NO. A-1-ZF

SUCTION LYSIMETER NO. A-1-ZF-SL1

GREGG & ASSOCIATES, INC.

CONSTRUCTION DETAILS	DEPTH	LOG	BLOW CNTS	LITHOLOGIC DESCRIPTION
	- 0 -			Concrete Sand, fine to medium grain, some [illegible] artificial fill
	- 1 -			
	- 2 -			
	- 3 -			
	- 4 -		17	
	- 5 -			
	- 6 -			
	- 7 -			Sand, fine to medium grain, brown to variegated brown, frequent cobbles
	- 8 -			
	- 9 -			
	- 10 -		23	
	- 11 -			
	- 12 -			
	- 13 -			
	- 14 -			
	- 15 -			
	- 16 -			
	- 17 -			
	- 18 -			
	- 19 -			
	- 20 -			

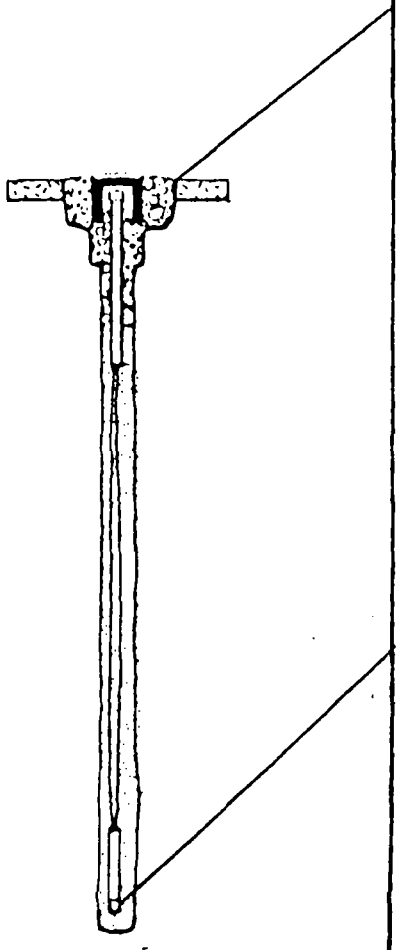
COMPLETION & BACKFILL

-Suction Lysimeter at 10 ft
-Concrete, 0-4 ft
-Bentonite, 4-5 ft
-Clean sand, 5-6 ft
-Silica sand, 6-10 ft

TANK NO. A-1-ZF

SUCTION LYSIMETER NO. A-1-ZF-SL2

GREGG & ASSOCIATES, INC.

CONSTRUCTION DETAILS	DEPTH	LOG	BLOW CNTS	LITHOLOGIC DESCRIPTION
	- 0 -			Concrete
	- 1 -			Sand, fine to medium grain, brown, w/small pea size gravel
	- 2 -			
	- 3 -			
	- 4 -			Cobbles from 4 to 6 ft
	- 5 -		20	
	- 6 -			
	- 7 -			
	- 8 -			Sand, fine grain, brown
	- 9 -			
	- 10 -		28	
	- 11 -			
	- 12 -			
	- 13 -			
	- 14 -			
	- 15 -			
	- 16 -			
	- 17 -			
	- 18 -			
	- 19 -			
	- 20 -			

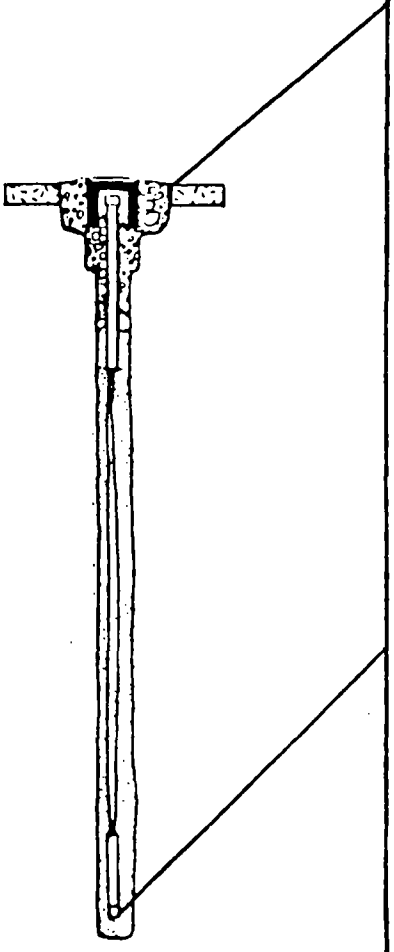
COMPLETION & BACKFILL

-Suction Lysimeter at 10 ft
-Blank 2-in I.D. PVC pipe, 0-5 ft
-Concrete, 0-4 ft
-Bentonite, 4-6 ft
-Silica sand & native sand 6.20 ft

TANK NO. A-1-ZF

SUCTION LYSIMETER NO. A-1-ZF-SL4

GREGG & ASSOCIATES, INC.

CONSTRUCTION DETAILS	DEPTH	LOG	BLOW CNTS	LITHOLOGIC DESCRIPTION
	- 0 -			Concrete
	- 1 -			Sand, fine to medium grain, brown, some pea size gravel
	- 2 -			
	- 3 -			
	- 4 -			
	- 5 -		20	Sand, fine to coarse grain, brown,
	- 6 -			large cobble
	- 7 -			
	- 8 -			Sand, very fine, some medium grain, brown
	- 9 -			
	- 10 -		32	
	- 11 -			
	- 12 -			
	- 13 -			
	- 14 -			
	- 15 -			
	- 16 -			
	- 17 -			
	- 18 -			
	- 19 -			
	- 20 -			

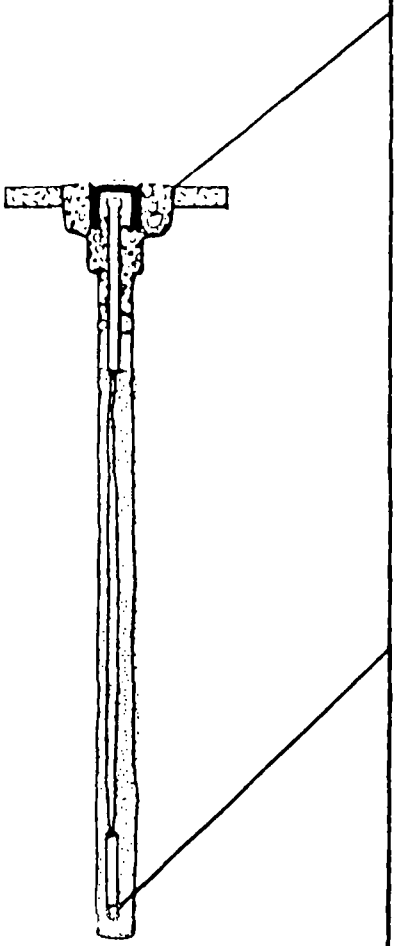
COMPLETION & BACKFILL

- Suction lysimeter at 10 ft
- Blank 2-in I.D. PVC pipe, 0-5 ft
- Concrete, 0-4 ft
- Bentonite, 4-6 ft
- Silica sand & native mix, 6-10 ft

TANK NO. A-1-ZF

SUCTION LYSIMETER NO. A-1-ZF-SL5

GREGG & ASSOCIATES, INC.

CONSTRUCTION DETAILS	DEPTH	LOG	BLOW CNTS	LITHOLOGIC DESCRIPTION
	- 0 - - 1 - - 2 - - 3 - - 4 - - 5 - - 6 - - 7 - - 8 - - 9 - - 10 - - 11 - - 12 - - 13 - - 14 - - 15 - - 16 - - 17 - - 18 - - 19 - - 20 -		43 13	Concrete Sand, fine to medium grain, brown, some gravel slightly coarser Cobble layer in very fine grain sand Sand, coarse grain, brown to red brown, very dry, w/pea size gravel

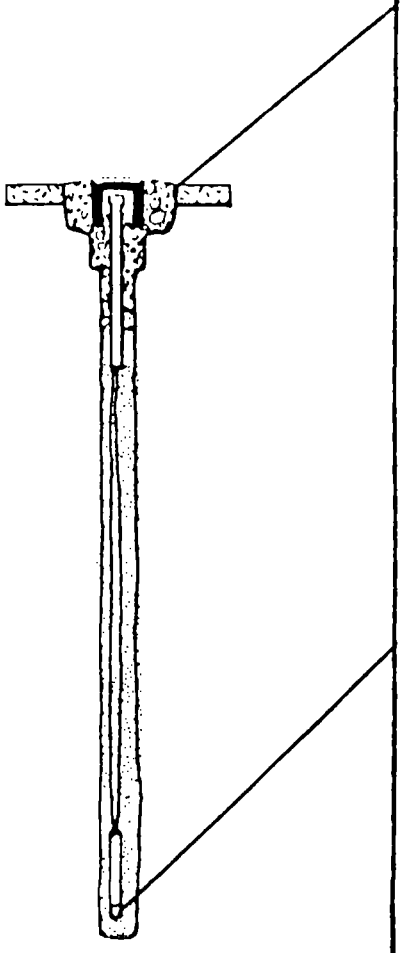
COMPLETION & BACKFILL

-Suction Lysimeter at 10 ft
-Blank 2-in I.D. PVC pipe, 0-5 ft
-Concrete, 0-3 ft
-Bentonite, 3-4 ft
-Silica sand & native mix, 6-10 ft

TANK NO. A-1-ZF

SUCTION LYSIMETER NO. A-1-ZF-SL6

GREGG & ASSOCIATES, INC.

CONSTRUCTION DETAILS	DEPTH	LOG	BLOW CNTS	LITHOLOGIC DESCRIPTION
	- 0 -			Concrete
	- 1 -			Sand, fine to medium grain, brown, some pebbles
	- 2 -			
	- 3 -			large cobble
	- 4 -			slightly grey
	- 5 -		30	numerous 2-in cobbles
	- 6 -			
	- 7 -			
	- 8 -			continued cobbles
	- 9 -			peasize gravel in sand, loose
	- 10 -		15	
	- 11 -			
	- 12 -			
	- 13 -			
	- 14 -			
	- 15 -			
	- 16 -			
	- 17 -			
	- 18 -			
	- 19 -			
	- 20 -			

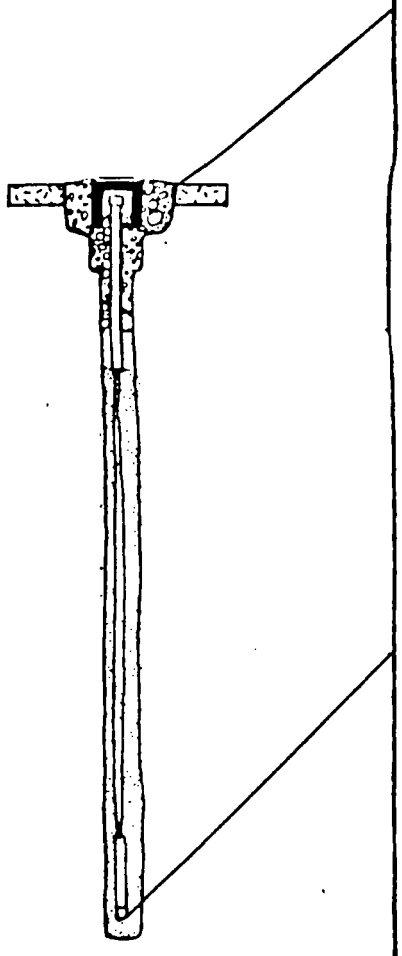
COMPLETION & BACKFILL

-Suction Lysimeter at 10 ft
-Blank 2-in I.D. PVC pipe, 0-5 ft
-Concrete, 0-3 ft
-Bentonite, 3-4 ft
-Clean sand, 4-6 ft
-Silica sand & native mix, 6-10 ft

TANK NO. A-1-ZF

SUCTION LYSIMETER NO. A-1-ZF-SL7

GREGG & ASSOCIATES, INC.

CONSTRUCTION DETAILS	DEPTH	LOG	BLOW CNTS	LITHOLOGIC DESCRIPTION
	- 0 - - 1 - - 2 - - 3 - - 4 - - 5 - - 6 - - 7 - - 8 - - 9 - - 10 - - 11 - - 12 - - 13 - - 14 - - 15 - - 16 - - 17 - - 18 - - 19 - - 20 -		28 14	Concrete Sand, medium to coarse grain, variegated brown, frequent pebbles & occasional cobbles, loose slightly darker brown

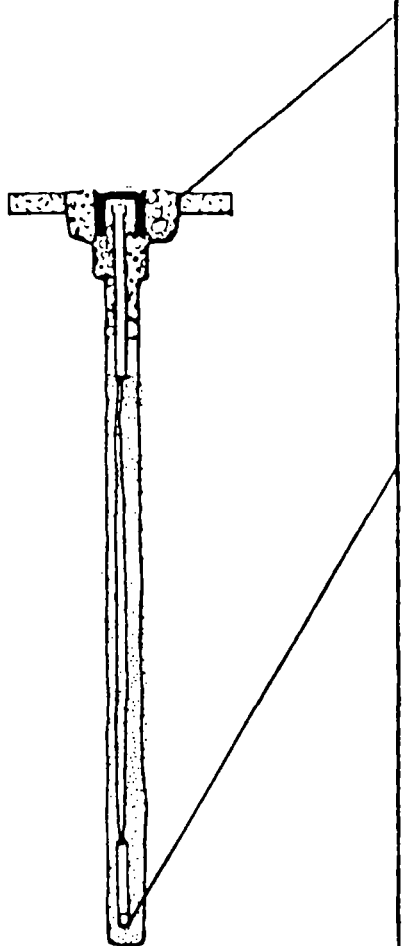
COMPLETION & BACKFILL

-Suction Lysimeter at 10 ft
-Blank 2-in I.D. PVC pipe, 0-5 ft
-Concrete, 0-3 ft
-Bentonite, 3-4 ft
-Clean sand, 4-6 ft
-Silica sand & native mix, 6-10 ft

TANK NO. A-1-ZF

SUCTION LYSIMETER NO. A-1-ZF-SL8

GREGG & ASSOCIATES, INC.

CONSTRUCTION DETAILS	DEPTH	LOG	BLOW CNTS	LITHOLOGIC DESCRIPTION
	- 0 - - 1 - - 2 - - 3 - - 4 - - 5 - - 6 - - 7 - - 8 - - 9 - - 10 - - 11 - - 12 - - 13 - - 14 - - 15 - - 16 - - 17 - - 18 - - 19 - - 20 -		30 19	Concrete Sand, medium to coarse grain, variegated light brown, loose, some pebbles occasional cobbles

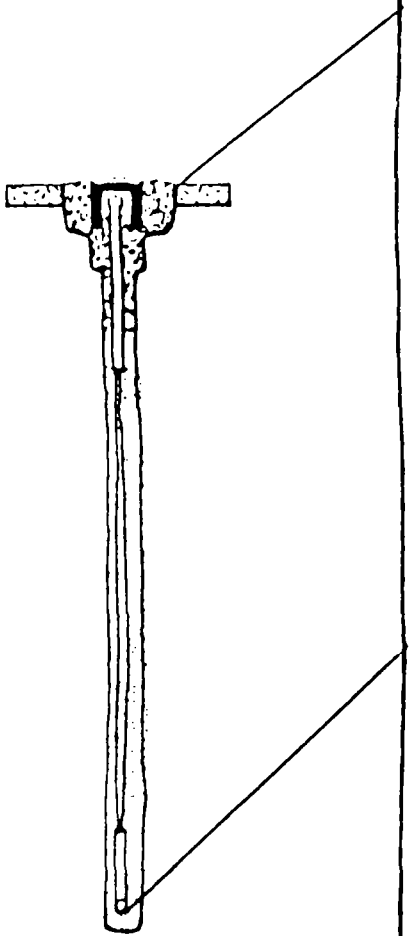
COMPLETION & BACKFILL

- Suction Lysimeter at 7 ft
- Blank 2-in I.D. PVC pipe, 0-5 ft
- Concrete, 0-3 ft
- Bentonite, 3-4 ft
- Clean sand, 4-5 ft
- Silica sand & native mix, 5-7 ft

TANK NO. A-1-ZF

SUCTION LYSIMETER NO. A-1-ZN-SL9

GREGG & ASSOCIATES, INC.

CONSTRUCTION DETAILS	DEPTH	LOG	BLOW CNTS	LITHOLOGIC DESCRIPTION
	- 0 - - 1 - - 2 - - 3 - - 4 - - 5 - - 6 - - 7 - - 8 - - 9 - - 10 - - 11 - - 12 - - 13 - - 14 - - 15 - - 16 - - 17 - - 18 - - 19 - - 20 -		20 14	Concrete Sand, fine to medium grain, dark brown, occasional pebbles & small cobbles Sand, fine to medium grain, brown

COMPLETION & BACKFILL

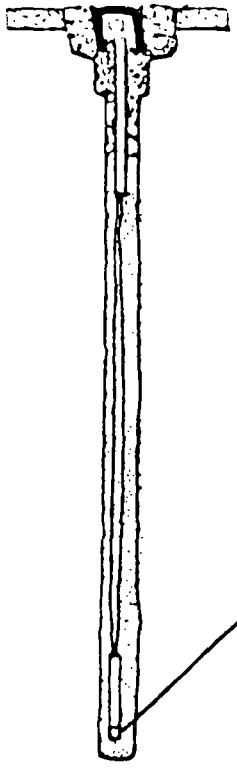
- Suction Lysimeter at 10 ft
- Blank 2-in I.D. PVC pipe, 0-5 ft
- Concrete, 0-3 ft
- Bentonite, 3-4 ft
- Clean sand, 4-6 ft
- Silica sand & native mix, 6-10 ft

TANK NO. A-1-A

SUCTION LYSIMETER NO. A-1-A-SL1

GREGG & ASSOCIATES, INC.

CONSTRUCTION DETAILS	DEPTH	LOG	BLOW CNTS	LITHOLOGIC DESCRIPTI
	- 0 -			Concrete, 8-in thick
				Sand, fine to coarse grain brown to variegated, occasional pebbles
	- 2 -			
	- 3 -			
	- 4 -			
	- 5 -		50	
	- 6 -			
	- 7 -			Cobble layer
	- 8 -			
	- 9 -			
	- 10 -		50	
	- 11 -			
	- 12 -			
	- 13 -			
	- 14 -			
	- 15 -			
	- 16 -			
	- 17 -			
	- 18 -			
	- 19 -			
	- 20 -			



COMPLETION & BACKFILL

-Suction Lysimeter at 10 ft
-Concrete, 0-4 ft
-Bentonite, 4-5 ft
-Clean sand & native mix, 5-10 ft

TANK NO. A-1-M

SUCTION LYSIMETER NO. A-1-M-SL1

GREGG & ASSOCIATES, I

Analytical Technologies, Inc. Corporate Offices 225 W. 30th Street National City, CA 92050 619 477-4173

November 12, 1984

RECEIVED NOV 15 1984

Gregg & Associates, Inc.
18351 Beach Blvd., Suite L
Huntington Beach, CA 92647

Attention: Dean Gregg

Re: Lockheed Project; #84-106

On October 25, 1984 Analytical Technologies, Inc. received the tenth shipment containing thirty-three (33) soil samples, collected from the Lockheed project site. The samples were analyzed for chromium, pH, petroleum hydrocarbons, oil & grease and volatile organics.

Outlined below is the disposition of each sample.

1) These samples were analyzed for soil pH and chromium.

A-1-2F-SL5	A1-A-SL6	5'	A-1-2F-SL1	A1-A-SL2	5'
A-1-2F-SL5	A1-A-SL6	10'	A-1-2F-SL1	A1-A-SL2	10'
A-1-2F-SL6	A1-A-SL7	5'	A-1-2F-SL2	A1-A-SL3	5'
A-1-2F-SL6	A1-A-SL7	10'	A-1-2F-SL2	A1-A-SL3	10'
A-1-2F-SL7	A1-A-SL8	6'	A-1-2F-SL3	A1-A-SL4	5'
A-1-2F-SL7	A1-A-SL8	10'	A-1-2F-SL3	A1-A-SL4	10'
A-1-A-SL1	A1-A-SL9	5'	A-1-2F-SL4	A1-A-SL5	5'
A-1-A-SL1	A1-A-SL9	10'	A-1-2F-SL4	A1-A-SL5	10'
A-1-2F-SL8	A1-A-SL10	5'	A-1-2F-SL9	A1-A-SL11	5'
A-1-2F-SL8	A1-A-SL10	10'	A-1-2F-SL9	A1-A-SL11	10'
A-1-M-SL1	A1-A-LSY 1	5.5'			
A-1-M-SL1	A1-A-LSY 1	10'			

Note: Sample ID numbe assigned in the field we changed after sampl were sent to the laboratory. The corrected ID num bers are shown

2) These two (2) samples were analyzed for volatile organics using GC/MS (EPA Method 8240).

Composite of B1-~~A~~FIS-B1 6', 13', 18', 30', 40'
Composite of B1-F14-MV1 12', 12', 25', 40'

3) These samples were analyzed for petroleum hydrocarbons (EPA Method 418.1) and/or oil and grease (EPA Method 413.2) using IR.

B1-~~A~~FIS-B1	6'	B1-F14-MV2	12'
B1-~~A~~-B1	13'	B1-F14-MV1	12'

07120

B1-FIS-B1	18'	B1-F14-MV1	25'
B1-FIS-B1	30'	B1-F14-MV1	40'
B1-FIS-B1	40'		
B1-F2-MV1	5'		
B1-F1-MV2	17'		

All analyses were in accordance with EPA methods or equivalent. Enclosed are the test results.

If you have any questions, please call.

Carolyn A. Sites
Carolyn A. Sites
Data Manager

Reviewed by
Mark King
Laboratory Manager

CAS:mat

Attachments

NOTE: Samples from this project will be disposed of in thirty (30) days from the date of this report, unless we are informed otherwise.

I.D. 01-001611

DATA SUMMARY

Sample I.D.		pH (units)	Chromium (mg/kg)
A-1-2F-SL5 ~~A1-A-SL6~~	5'	7.25	3.1
A-1-2F-SL5 ~~A1-A-SL6~~	10'	8.27	2.7
A-1-2F-SL6 ~~A1-A-SL7~~	5'	9.37	4.5
A-1-2F-SL6 ~~A1-A-SL7~~	10'	8.53	11.3
A-1-2F-SL7 ~~A1-A-SL8~~	6'	8.78	7.6
A-1-7F-SL7 ~~A1-A-SL8~~	10'	8.25	12.1
A-1-A-SL1 ~~A1-A-SL9~~	5'	7.88	102
A-1-A-SL1 ~~A1-A-SL9~~	10'	7.91	65.8
A-1-2F-SL8 ~~A1-A-SL10~~	5'	8.08	5.2
A-1-2F-SL8 ~~A1-A-SL10~~	10'	7.56	23.7
A-1-M-SL1 ~~A1-A-LSY-1~~	5.5'	9.80	6.4
A-1-M-SL1 ~~A1-A-LSY-1~~	10'	7.95	30.1
A-1-2F-SL1 ~~A1-A-SL2~~	5'	8.69	40.0
A-1-2F-SL1 ~~A1-A-SL2~~	10'	7.92	48.1
A-1-2F-SL2 ~~A1-A-SL3~~	5'	8.43	6.8
A-1-2F-SL2 ~~A1-A-SL3~~	10'	8.53	6.2
A-1-2F-SL3 ~~A1-A-SL4~~	5'	8.25	4.7
A-1-2F-SL3 ~~A1-A-SL4~~	10'	8.44	4.8
A-1-2F-SL4 ~~A1-A-SL5~~	5'	8.62	19.8
A-1-2F-SL4 ~~A1-A-SL5~~	10'	8.78	2.6
A-1-2F-SL9 ~~A1-A-SL11~~	5'	8.80	16.1
A-1-2F-SL9 ~~A1-A-SL11~~	10'	8.59	25.9

Note: Sample ID Numbers assigned in the field were changed after samples were sent to the laboratory. The correct ID Numbers are shown above.

I.D. 01-001611 -1

SULFATE ANALYSES

Gregg & Associates
Lockheed Project

Date of Analysis: 11-12-84

Sample I.D.	Soluble Sulfate (mg/kg)
A-1-2F-SL5 ~~A1-A-SL6~~ 5'	9.3
A-1-2F-SL5 ~~A1-A-SL-6~~ 10'	<8.0
A-1-2F-SL6 ~~A1-A-SL7~~ 5'	17
A-1-2F-SL6 ~~A1-A-SL7~~ 10'	13
A-1-2F-SL7 ~~A1-A-SL8~~ 5'	10
A-1-2F-SL7 ~~A1-A-SL8~~ 10'	13
A-1-A-SL1 ~~A1-A-SL9~~ 5'	250
A-1-A-SL1 ~~A1-A-SL9~~ 10'	260
A-1-2F-SL8 ~~A1-A-SL10~~ 5'	26
A-1-2F-SL8 ~~A1-A-SL10~~ 10'	80
A-1-M-SL1 ~~A1-A-LSY-1~~ 5.5'	81
A-1-M-SL1 ~~A1-A-LSY-1~~ 10'	210
A-1-2F-SL1 ~~A1-A-SL2~~ 5'	41
A-1-2F-SL1 ~~A1-A-SL2~~ 10'	30
A-1-2F-SL2 ~~A1-A-SL3~~ 5'	18
A-1-2F-SL2 ~~A1-A-SL3~~ 10'	17
A-1-2F-SL3 ~~A1-A-SL4~~ 5'	8.7
A-1-2F-SL3 ~~A1-A-SL4~~ 10'	11
A-1-2F-SL4 ~~A1-A-SL5~~ 5'	14
A-1-2F-SL4 ~~A1-A-SL5~~ 10'	<8.0
A-1-2F-SL9 ~~A1-A-SL11~~ 5'	33
A-1-2F-SL9 ~~A1-A-SL11~~ 10'	27

Note: Sample ID numbers assigned in the field were changed after samples were sent to the laboratory. The corrected ID numbers are shown above.